

Amendments to the Claims: This listing of claims will replace all prior versions, and listings, of claims in the application

Listing of Claims:

1. (Currently Amended) A catheter having a distal end and a proximal end and comprising an elongated tube having an interior defined by a sidewall and having one or more openings disposed at the proximal end and the distal end as well as a plurality of openings in the sidewall, a septum that divides the interior into at least a first lumen and a second lumen having a distalmost portion, and at least a portion of the catheter spirally formed into a corkscrew pattern to define a corkscrew-patterned portion having at least two lumens, wherein said first lumen extends distally beyond said distalmost portion of said second lumen and at least one of said openings is coincident with the corkscrew-patterned portion.

2. (Cancelled)

3. (Original) The catheter of claim 2, wherein the corkscrew pattern comprises an outer diameter (d_o) and the at least one of said sidewall openings is positioned facing away from the outer diameter.

4. (Original) The catheter of claim 1, wherein the tube has a tube diameter (d_t) in a range of approximately 0.2-0.7 centimeters, and the corkscrew pattern has an outer diameter (d_o) in a range of approximately 1-5 centimeters.

5. (Original) The catheter of claim 2, wherein the plurality of sidewall openings are distributed in a helical pattern along the sidewall.

6. (Cancelled)

7. (Previously Presented) The catheter of claim 1, wherein the first lumen and the second lumen form a double helix in a portion of the catheter coincident with the one or more openings.

8. (Original) The catheter of claim 7, wherein the openings are distributed on the sidewall at an angle of 90° relative to the septum.

9. (Currently Amended) The catheter of claim 1, wherein the first lumen and the second lumen form a double helix along an entire length of the catheter.

10. (Previously Presented) The catheter of claim 1, wherein the septum divides the interior into more than two lumens that form a multiple helix.

11. (Original) The catheter of claim 10, wherein the more than two lumens form a multiple helix along an entire length of the catheter.

12. (Cancelled)

13. (Original) The catheter of claim 1, wherein the corkscrew pattern terminates with the catheter pointed in an axial direction.

14. (Original) The catheter of claim 1, wherein the corkscrew pattern terminates with the catheter pointed circumferentially.

15. (Original) The catheter of claim 1, wherein the corkscrew pattern terminates with the catheter pointed tangentially.

16. (Original) The catheter of claim 1, wherein at least a plurality of the one or more openings are radially formed in the sidewall.

17. (Original) The catheter of claim 1, wherein the catheter has a central axis, and at least a plurality of the one or more openings are formed in the sidewalls at a non-perpendicular angle relative to the central axis.

18. (Original) The catheter of claim 1, wherein the catheter is a perfusion catheter.

19. (Original) The catheter of claim 18, wherein the catheter is a hemodialysis catheter.

20. (Original) The catheter of claim 1, wherein the catheter comprises a flexible polymer.

21. (Original) The catheter of claim 1, wherein the catheter comprises a thermoplastic elastomer.

22. (Original) The catheter of claim 1, wherein the catheter comprises a material of construction selected from the group consisting of: polyvinylchloride, polyethylene,

polypropylene, polyurethane, nylon, a polyether block amide, metal, carbon fibers, glass fibers, a combination thereof, and a composite thereof.

23. (Original) The catheter of claim 1, wherein the catheter comprises at least one layer that comprises a braided architecture.

24. (Currently Amended) The catheter of claim 1, ~~wherein the catheter is a single lumen catheter having an open~~ having at least one open distal end and a tube diameter (d_t), the corkscrew pattern defines a space comprising an outer diameter (d_o) greater than the tube diameter, and the open end is positioned centrally within the space.

25. (Original) The catheter of claim 1, wherein the catheter comprises a tunneling catheter.

26. (Withdrawn) A catheter comprising an elongated tube having an interior defined by a sidewall and a septum dividing the interior into at least a first lumen and a second lumen, wherein the first lumen and the second lumen form a double helix at least in a portion of the catheter coincident with one or more openings in the catheter.

27. (Withdrawn) The catheter of claim 26, wherein the first lumen and the second lumen form a double helix along an entire length of the catheter.

28. (Withdrawn) The catheter of claim 26, wherein the septum divides the interior into more than two lumens that form a multiple helix.

29. (Withdrawn) The catheter of claim 28, wherein the more than two lumens form a multiple helix along an entire length of the catheter.

30. (Withdrawn) The catheter of claim 26, wherein the catheter is a perfusion catheter.

31. (Withdrawn) The catheter of claim 26, wherein the catheter is a hemodialysis catheter.

32. (Withdrawn) The catheter of claim 26, wherein the first lumen extends distally further than a distal end of the second lumen.

33. (Withdrawn) The catheter of claim 26, wherein the one or more openings comprises a plurality of openings in the sidewall.

34. (Withdrawn) The catheter of claim 26, wherein the catheter comprises a flexible polymer.

35. (Withdrawn) The catheter of claim 26, wherein the catheter comprises a thermoplastic elastomer.

36. (Withdrawn) The catheter of claim 26, wherein the catheter comprises a material of construction selected from the group consisting of: polyvinylchloride, polyethylene, polypropylene, polyurethane, nylon, a polyether block amide, metal, carbon fibers, glass fibers, a combination thereof, and a composite thereof.

37. (Withdrawn) A multi-lumen catheter having a sidewall and one or more openings, the catheter adapted for minimized obstruction of the one or more openings by a lumen wall in which the catheter is positioned, wherein, in at least in a portion of the catheter coincident with the one or more openings, the catheter:

(a) further comprises a twisting septum dividing an interior of the catheter into multiple lumens, the multiple lumens forming a multi-helix;

(b) is spirally formed into a corkscrew pattern;

(c) is formed into an inwardly spiraling portion having a periphery that defines an open area, the one or more openings positioned facing or within the open area; or

(d) a combination of (a) and (b) or (a) and (c).

38. (Withdrawn) A multi-lumen catheter tip having a sidewall and one or more openings, the catheter tip adapted for minimized obstruction of the one or more openings by a lumen wall in which the catheter tip is positioned, wherein the catheter tip:

(a) further comprises a twisting septum dividing an interior of the catheter tip into multiple lumens, the multiple lumens forming a multi-helix;

(b) is spirally formed into a corkscrew pattern;

(c) is formed into an inwardly spiraling portion having a periphery that defines an open area, the one or more openings positioned facing or within the open area; or

(d) a combination of (a) and (b) or (a) and (c).

39. (Cancelled)

40. (Cancelled)

41. (Cancelled)

42. (Cancelled)

43. (Cancelled)

44. (Withdrawn) The method of claim 43, wherein step (a) comprises deploying the catheter in the body lumen of a patient having a heart with a right atrium such that the a distal end of the catheter is located in or adjacent to the right atrium of the patient's heart.

45. (Withdrawn) The method of claim 44, wherein the catheter tip comprises a corkscrew pattern and the second lumen extends distally further than a distal end of the first lumen and is pointed in a direction toward the right atrium, wherein step (d) comprises returning the blood in a stream directed toward the right atrium.

46. (Withdrawn) A catheter comprising an elongated tube having one or more openings, at least a portion of the catheter coincident with the one or more openings formed into an inwardly spiraling portion having a periphery that defines an open area, the one or more openings positioned within the open area or facing the open area.

47. (Withdrawn) The catheter of claim 46, wherein the catheter comprises an open end, wherein the open end is positioned within the open area.

48. (Withdrawn) The catheter of claim 47, wherein the catheter comprises a single lumen catheter.

49. (Withdrawn) The catheter of claim 46, wherein the catheter comprises a sidewall and a plurality of openings in the sidewall wherein the plurality of sidewall openings are positioned facing the open area.

50. (Withdrawn) A catheter for deployment in a lumen having a wall, the catheter comprising an elongated tube comprising a catheter tip, one or more openings in the catheter tip, and a deformation in the catheter tip for preventing the one or more openings from contacting the lumen wall.

51. (Withdrawn) The catheter of claim 50, wherein the deformation comprises a corkscrew pattern.

52. (Withdrawn) The catheter of claim 50, wherein the deformation comprises an inwardly spiraling portion.

53. (Withdrawn) The catheter of claim 52, wherein the catheter comprises an uncurled portion proximal of the inwardly spiraling portion having a lower surface that lies within a first plane tangential to the lower surface, the inwardly spiraling portion curling away from the first plane and lying at least partially within a second plane perpendicular to the first plane.

54. (Withdrawn) The catheter of claim 53, wherein the inwardly spiraling portion comprises a curl of greater than 360 degrees.

55. (Withdrawn) The catheter of claim 53, wherein the inwardly spiraling portion comprises a curl of approximately 360 degrees.

56. (Withdrawn) The catheter of claim 53, wherein the inwardly spiraling portion comprises a curl of less than 360 degrees.

57. (Withdrawn) The catheter of claim 53, wherein the inwardly spiraling portion does not cross the first plane.

58. (Withdrawn) The catheter of claim 53, wherein the inwardly spiraling portion comprises a portion that is parallel to the uncurled section and lies on the first plane.

59. (Withdrawn) The catheter of claim 53, wherein the inwardly spiraling portion crosses the first plane.

60. (Withdrawn) The catheter of claim 52, wherein the one or more openings comprise a plurality of openings in a sidewall of the catheter.

61. (Withdrawn) The catheter of claim 60, wherein the inwardly spiraling portion comprises an inner periphery that defines an area of open space inside the inner periphery and the openings face into the open space.

62. (Withdrawn) The catheter of claim 61, wherein the one or more openings comprises at least one opening at a distal end of the catheter positioned inside the open space.

63. (Withdrawn) The catheter of claim 52, wherein the inwardly spiraling portion comprises an inner periphery that defines an area of open space inside the inner periphery and the one or more openings comprises at least one opening at a distal end of the catheter positioned inside the open space.

64. (Previously Presented) The catheter of claim 1, wherein said first lumen extends distally further than the distal most part said inner parameter of said second lumen by more than about 1 centimeter.

65. (Previously Presented) The catheter of claim 1, wherein said first lumen extends distally further than the distal most part said second inner parameter of said second lumen by less than about 3 centimeters.